UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/053,231	01/17/2002	Shunichi Matsushita	NAGAT32.001AUS	3907

20995 7590 02/25/2004

KNOBBE MARTENS OLSON & BEAR LLP
2040 MAIN STREET
FOURTEENTH FLOOR
IRVINE, CA 92614

EXAMINER	
LEE, JOHN D	

ART UNIT	PAPER NUMBER
2874	

DATE MAILED: 02/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/053,231	MATSUSHITA ET AL.	
	Examiner	Art Unit	
	John D. Lee	2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *4-9,18,19,23/19,24/19,and 25/19* is/are allowed.

6)☒ Claim(s) *1-3,10-17,20-22,25/20, and 26-33* is/are rejected.

7)☒ Claim(s) *23/20 and 24/20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 January 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *04/23/02*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Receipt is acknowledged of papers submitted under 35 U.S.C. §§ 119(a)-(d), which papers have been placed of record in the file.

The seven (7) sheets of drawing filed with this application on January 17, 2002, are acceptable.

The abstract of the disclosure is objected to because of the following minor informalities. In the fourth line, "an pump" should be "a pump", and in the seventh line, the word "one" should be inserted before "side". Correction is required. See MPEP § 608.01(b).

The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claims 1, 7, 16, 17, 19, 20, and 26 are objected to because of the following minor informalities: In claim 1, line 3, "an pump" should be "a pump". In claim 7, line 7, "an pump" should be "a pump". In claim 7, line 8, "said" should be deleted before "frequency". In claim 7, line 16, the word "a" at the end of the line should be deleted. In line 1 of each of claims 16 and 17, the word "apparatus" should be changed to "method". In claim 19, line 1, the word "a" should be inserted after "converting". In claim 19, line 4, "said average" should be changed to "an average" (since there is no antecedent support for the present language). In the last line of claim 19, "grater" should be "greater". In lines 2 and 3 of claim 20, "WDM" should be deleted since there is no antecedent support for the terminology. In the last line of claim 26, "occupies" should be "occupied". Appropriate correction is required.

The following is a quotation of the second paragraph of 35 U.S.C. § 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 21, 22, and 28-30 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 21 is indefinite because the limitation set forth therein (a single pump lightwave) is incompatible with the requirement of a claim from which it depends (claim 19, which requires two pump lightwaves). The intended scope of the claim is therefore uncertain. It is suggested that claim 21 be amended to depend solely from claim 20. Claim 22, being dependent upon claim 21, inherently contains the same indefiniteness. Claims 28-30 are indefinite because they purport to describe a "wavelength converter", but there are no elements set forth therein that would actually define a wavelength converter. Note that first and second branches having pumping sources coupled thereto does not necessarily define a wavelength converter. There is no claimed element (e.g. a nonlinear optical element or a nonlinear optical waveguide) for actually performing wavelength conversion.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 26 is rejected under 35 U.S.C. § 102(e) as being clearly anticipated by U.S. Patent Application Publication 2001/0007509 A1 to Aso et al. Aso et al discloses an optical signal wavelength conversion system comprising a conversion medium based on optical four-wave-mixing, an optical signal input to the medium, a pump light source input to the medium, and a converted signal output from the medium. The Aso et al system also includes means for preventing noise produced by improper four-wave-mixing from appearing in the converted signal output (paragraph **[0098]**).

Claim 27 is rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application Publication 2001/0007509 A1 to Aso et al. Aso et al discloses that it is the "optimized design" of the dispersion managed transmission line that effects the noise prevention feature described in the immediately preceding paragraph of this Office action. While the meaning of such "optimized design" is not clear, the person of ordinary skill in the art would understand it to include the possibility of a guard band surrounding the pump source. Therefore, to have the Aso et al system include a guard band surrounding the pump source would have been obvious to a person of ordinary skill in the art.

Claims 1-3, 10-17, 20, 21/20, 22/20, and 25/20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the April 2000 ELECTRONICS LETTERS article by

Aso et al (submitted by applicant). Aso et al discloses a method and apparatus for optical WDM signal wavelength conversion based on four-wave-mixing the optical signal channels and a pumping lightwave in a nonlinear dispersion-shifted optical fiber waveguide. Aso et al shows in Figure 3 that the frequency (wavelength) of the pumping lightwave is outside the frequency bandwidths of both the input signal channels and the converted signal channels. The Aso et al article does not indicate specifically that the frequency of the pumping lightwave is chosen such that the difference between that frequency and the frequency of any chosen input optical signal channel is equal to or greater than the frequency bandwidth spanned by the input optical signal channels. The choosing of these frequencies, however, is done in order to maximize the four-wave-mixing process in the nonlinear optical fiber. The choosing of frequencies having this claimed relationship, then, would have been within the purview of what is done in the article and thus would have been obvious to a person of ordinary skill in the art. On page 710 of the reference, it is stated that (in the experiment) the zero dispersion wavelength of the nonlinear optical fiber is 1564.2 nm. It can be seen in Figure 3 that this coincides with the wavelength (frequency) of the pumping lightwave. The Figure 3 information would also imply to one of ordinary skill in the art that the pumping lightwave wavelength could be WBW greater than the highest signal channel wavelength or WBW smaller than the lowest signal channel wavelength. With respect to claim 20, notice that Aso et al suggests means for reducing or eliminating amplified noise (page 710, last paragraph). Thus, having the converted output signals be within a frequency range that is outside any frequency band containing noise (such as noise from improper four-

wave-mixing) would have been obvious to a person of ordinary skill. Also, to have the Aso et al system include a guard band surrounding the pump lightwave would have been an obvious way of eliminating or reducing such noise (to a person of ordinary skill in the art).

Claims 28-30 are further rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 4,881,790 to Mollenauer. Mollenauer discloses an optical fiber based Raman amplification system which inherently converts wavelengths of light input thereinto. The Mollenauer system includes branches (see Figure 6) which are pumped by individual pump sources. However, in Figure 8, Mollenauer describes the possibility of one branch having multiple pump sources which are coupled together. Therefore, it would have been obvious to a person of ordinary skill in the art to have combined these teachings within the Mollenauer reference, and to provide a system like that of Figure 6 but wherein one of the branches has the plural pumps of Figure 8. The choice of the pumping frequencies for the individual pump sources would then be made in order to maximize the device's operation for a particular application. Applicant's claim 29 and 30 limitations would thus have been obvious in Mollenauer.

Claims 31-33 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,529,314 to Shukunami et al. Shukunami et al discloses an optical fiber based wavelength conversion device which could be used as a multifrequency light source. See Figure 8. The Shukunami et al device comprises (N=2) light sources of wavelengths $\lambda(\omega 1)$ and $\lambda(\omega 2)$, a multiplexer 16 having the (N=2) light sources as input and a multiplexed output, and a wavelength converter utilizing four-wave-mixing which

has the multiplexed output as an input and which has (2N+1=5) optical signal outputs. These outputs have wavelengths of $\lambda(\omega 1)$, $\lambda(\omega 2)$, $\lambda(\omega 3)$, $\lambda(\omega 1+\omega 2-\omega 3)$, and $\lambda(\omega 1+\omega 2+\omega 3)$. Although there are more output wavelengths in Shukunami et al (2N+1) than in applicant's claim 31 (2N), it is noted that applicant's claim language reads "comprising", so that Shukunami et al does have the claimed number (plus one more). Since filter 32 is used in Shukunami et al prior to the final output, the person of ordinary skill in the art would have found it obvious to filter out any of the (2N+1=5) optical signal outputs, and having only (2N=4) optical signals outputs would have been obvious. The provision of a demultiplexer at the device output (for selecting and routing individual ones of the signal outputs) would also have been obvious. The Shukunami et al light sources are laser diodes (i.e. photodiodes).

Claims 4-9, 18, 19, 23/19, 24/19, and 25/19 are allowable over the prior art of record. The very specific method steps and apparatus elements set forth in these claims are not disclosed or suggested by any of the prior art references of record.

Claims 23/20 and 24/20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The Aso et al article does not disclose or suggest the use of at least two pump lightwaves.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent 6,101,024 to Islam et al describes a nonlinear optical fiber amplifier/wavelength converter for WDM optical signal channels, but does not disclose or suggest applicant's claimed requirements for the pumping wavelength(s)

with respect to the WDM signal channel wavelengths. U.S. Patent 6,271,960 to Michishita et al illustrates an optical wavelength converter having a plurality of laser diode light sources which are multiplexed for input to the wavelength conversion element. U.S. Patent 6,330,104 to Kim et al discloses another optical wavelength conversion apparatus and method based upon four-wave-mixing in an optical fiber waveguide, and wherein the pumping wavelength is spaced from the signal wavelengths. U.S. Patent 6,657,773 to Chiaroni et al (Figure 3) shows an optical wavelength converter which multiplexes a plurality of light signals from distinct sources as input to the wavelength conversion element.

All of the prior art documents submitted by applicant in the Information Disclosure Statement filed on April 23, 2002, including the Aso et al article relied on in one of the rejections above, have been considered and made of record. Note the attached initialed copy of form PTO-1449.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. § 103(a), the Examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR § 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. § 103(c) and potential 35 U.S.C. §§ 102(e), (f) or (g) prior art under 35 U.S.C. § 103(a).

Any inquiry concerning the merits of this communication should be directed to Examiner John D. Lee at telephone number (571) 272-2351. The Examiner's normal work schedule is Tuesday through Friday, 6:30 AM to 5:00 PM. Any inquiry of a general or clerical nature (i.e. a request for a missing form or paper, etc.) should be directed to the Technology Center 2800 receptionist at telephone number (703) 308-0956, to the technical support staff supervisor (Team 8) at telephone number (571) 272-1564, or to the Technology Center 2800 Customer Service Office at telephone number (571) 272-1626.

John D. Lee
Primary Patent Examiner
Group Art Unit 2874